What Makes a Sustainable Biomaterial?

Brenda Platt, SBC Co-Chair

Presentation to
the Sustainable Packaging Coalition
Open Forum
October 28, 2010

Overview

- Intro to the Sustainable Biomaterials Collaborative
- Framework for Sustainable Biomaterials
  - Biomass Feedstock Sourcing
  - Production and Use
  - End of Life
- Market-Based Tools
  - Purchasing Specifications
  - Working Landscape Certificates

Sustainable Biomaterials Collaborative

The Sustainable Biomaterials Collaborative is a network of organizations working together to spur the introduction and use of biomaterials that are sustainable from cradle to cradle. The Collaborative is creating sustainability guidelines, engaging markets, and promoting policy initiatives.

As You Sow
Center for Health, Environment and Justice
Clean Production Action *
Environmental Health Fund *
Green Harvest Technologies
Health Care Without Harm
Healthy Building Network
Institute for Agriculture and Trade Policy *
Institute for Local Self-Reliance*
Lowell Center for Sustainable Production *
Sustainable Research Group
Pure Strategies
RecycleWorld Consulting
Science & Environmental Health Network
Seventh Generation
National Campaign for Sustainable Ag.

* Steering committee

SBC
SUSTAINABLE BIOMATERIALS COLLABORATIVE

Biomaterial – Wonder Material?

- "renewable"
- "green
- "eco-friendly"
- "sustainable"
- "environmentally neutral"
- "safe and better"
- "easy on the environment"
- "return to nature without a trace"

Confusion

Making Plastic Bottles Environmentally Friendly

In an effort to help reduce the tons of discarded plastic bottles accumulating in our nation's landfills, ENSO Bottles™, in partnership with Resilux America is bringing a biodegrable technology to the plastic packaging industry available in specially formulated additive, preforms and blown plastic bottles. ENSO Bottles™ is dedicated to providing earth friendly packaging solutions to customers seeking a biodegradable packaging alternative.

ENSO bottles are not Oxo biodegradable or PLA plastic (corn based) bottles. ENSO bottles are plastic containers that biodegrade in anaerobic (landfill) environments, breaking down through microbial action into biogases and inert humus leaving behind no harmful materials. ENSO bottles are recyclable and can be mixed into the recycling stream with other plastic bottles.

To learn more about our products check out our Products page or speak on one of our Sales Representatives. We would be happy to assist you.

ENSO Bottles™

Bottles for a Healthier Earth™

Source: www.ensobottles.com

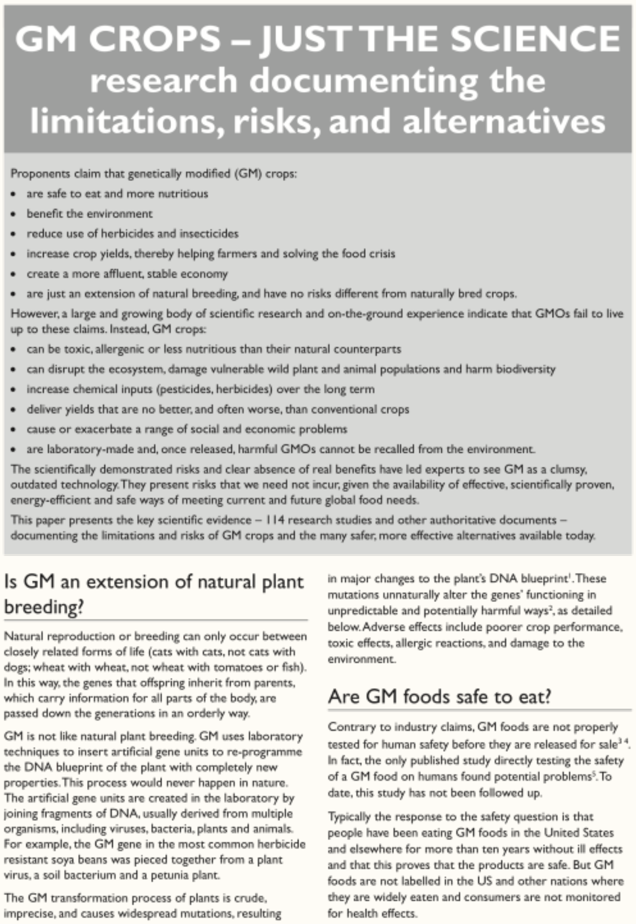
Not All Bioproducts Created Equal

- Biobased content
- Material feedstock type
- Feedstock location
- Biodegradability
  - Commercial compost sites
  - Home composting
  - Marine environment
  - Anaerobic digestion
- Additives and blends
- Recyclability
- Performance
- Products

Challenges with Bioplastics

- Concern over genetically modified organisms (GMOs)
- Desire for sustainably grown biomass
- Need to develop adequate composting programs
- Concern with nanocomposites and fossil-fuel-plastic blends
- Lack of adequate labeling
- Concern over contamination of recycling systems

Genetically Modified Crops



GM CROPS – JUST THE SCIENCE
research documenting the limitations, risks, and alternatives

Proponents claim that genetically modified (GM) crops:

- are safe to eat and more nutritious
- benefit the environment
- reduce use of herbicides and insecticides
- increase crop yields, thereby helping farmers and solving the food crisis
- create a more affluent, stable economy
- are just an extension of natural breeding, and have no risks different from naturally bred crops.

However, a large and growing body of scientific research and on-the-ground experience indicate that GMOs fail to live up to these claims. Instead, GM crops:

- can be toxic, allergenic or less nutritious than their natural counterparts
- can disrupt the ecosystem, damage vulnerable wild plant and animal populations and harm biodiversity
- increase chemical inputs (pesticides, herbicides) over the long term
- deliver yields that are no better, and often worse, than conventional crops
- cause or exacerbate a range of social and economic problems
- are laboratory-made and, once released, harmful GMOs cannot be recalled from the environment.

The scientifically demonstrated risks and clear absence of real benefits have led experts to see GM as a clumsy, outdated technology. They present risks that we need not incur, given the availability of effective, scientifically proven, energy-efficient and safe ways of meeting current and future global food needs.

This paper presents the key scientific evidence – 114 research studies and other authoritative documents – documenting the limitations and risks of GM crops and the many safer, more effective alternatives available today.

Is GM an extension of natural plant breeding?

Natural reproduction or breeding can only occur between closely related forms of life (cats with cats, not cats with dogs; wheat with wheat, not wheat with tomatoes or fish). In this way, the genes that offspring inherit from parents, which carry information for all parts of the body, are passed down the generations in an orderly way.

GM is not like natural plant breeding. GM uses laboratory techniques to insert artificial gene units to re-programme the DNA blueprint of the plant with completely new properties. This process would never happen in nature. The artificial gene units are created in the laboratory by joining fragments of DNA, usually derived from multiple organisms, including viruses, bacteria, plants and animals. For example, the GM gene in the most common herbicide resistant soya beans was pieced together from a plant virus, a soil bacterium and a petunia plant.

The GM transformation process of plants is crude, imprecise, and causes widespread mutations, resulting in major changes to the plant's DNA blueprint[1]. These mutations unnaturally alter the genes' functioning in unpredictable and potentially harmful ways[2], as detailed below. Adverse effects include poorer crop performance, toxic effects, allergic reactions, and damage to the environment.

Are GM foods safe to eat?

Contrary to industry claims, GM foods are not properly tested for human safety before they are released for sale[3 4]. In fact, the only published study directly testing the safety of a GM food on humans found potential problems[5]. To date, this study has not been followed up.

Typically the response to the safety question is that people have been eating GM foods in the United States and elsewhere for more than ten years without ill effects and that this proves that the products are safe. But GM foods are not labelled in the US and other nations where they are widely eaten and consumers are not monitored for health effects.

- Can be toxic, allergenic or less nutritious than their natural counterparts
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Source: http://www.nongmoproject.org/

What We Put Into Corn…

- Average of over 120 lbs. nitrogen fertilizer per acre
- Among the highest levels of herbicide and pesticide use for conventional crops
- Irrigation water
- Proprietary hybrids

What Else is Produced

- Soil erosion and nutrient run-off and leaching
- Water, air, soil, health and biodiversity impacts of chemical use
- Pressure on alternate land uses
- Reduced rural economic benefit from agricultural production

Survey Data: feedstock types and sources

- China
  - Bulrush
  - Bagasse
  - PSM (Plastarch Material)
  - Corn
  - Chinese PLA
  - PHBV*
  - PBS**
  - Cornstarch
- India
  - Fallen palm leaves
- Thailand/Vietnam
  - Tapioca starch
  - Grass fiber
  - Bagasse
- Malaysia
  - Palm fiber
- USA
  - NatureWorks PLA
  - "Natural total chlorine-free pulp"
  - Recycled wood fiber

*polyhydroxybutyrate-polyhydroxyvalerate

**polybutylene succinate (petrochemical + succinic acid)

Path from Field to Producer

"The source product is from Brazil, then turned into cornstarch in China, then the starch is used in our manufacturer's facility."

"Feedstocks grown in Midwestern US. Manufacture the resin in Hawthorne, CA today, but plan to manufacture in Seymour, IN shortly."

Recyclable?


Mother Earth's future is in your hands
This innovative product is the 1st All Natural Lemonade to be poured into an ALL NATURAL BOTTLE. Noble is simply too good to be poured into a plastic bottle made from oil, so our team of juiceologists went to work to find a container worthy of Noble. They explored the world to find the "E Bottle," an eco - friendly bottle made from nature. Not only is our bottle better for our juice, it is better for the environment.
Better Earth.
Better Juice.
Better Bottle.
BOTTLE MADE FROM
NatureWorks PLA


USDA
Sweetened with Agave

Where’s Waldo?

Identifying and Sorting Bio-Bottles

Courtesy of Eureka Recycling, Minneapolis, MN (www.eurekarecycling.org)

Tricky?

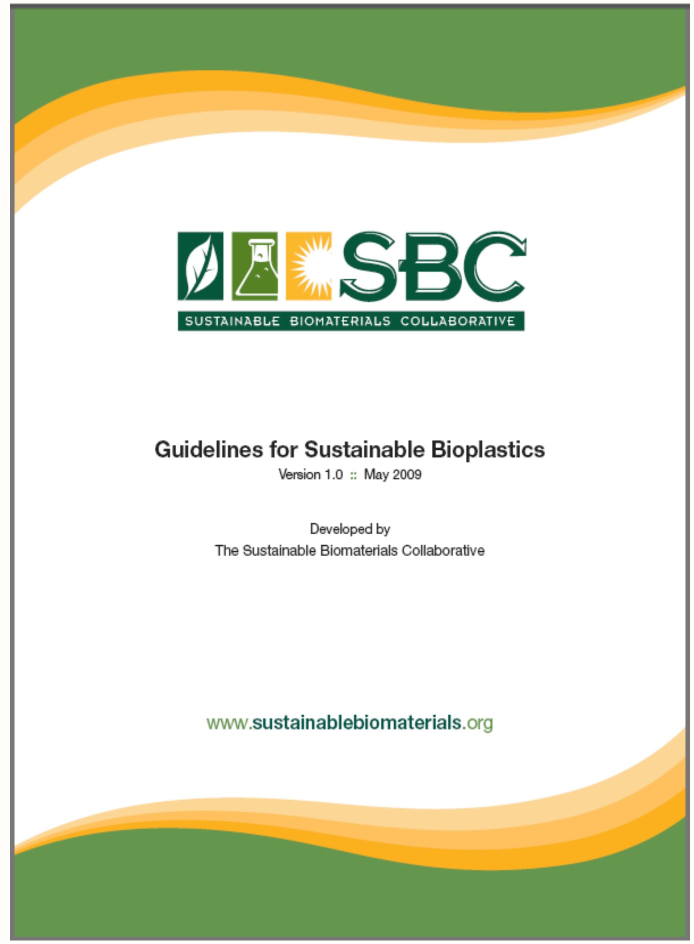
At 120 feet per minute on a 30” wide conveyor line – It sure is!

Courtesy of Eureka Recycling, Minneapolis, MN (www.eurekarecycling.org)

Defining Sustainable Life Cycles by Principles

- Sustainable feedstocks / Sustainable agriculture
- Green Chemistry / Clean Production
- Closed Loop Systems / Cradle to Cradle / Zero Waste

"Just because it's biobased, doesn't make it green"



A Sustainable Bioeconomy

- Provides the food, fuel, fiber and materials we need
- Protects and enhances the environment
- Benefits family farms, rural communities and society
- Is fair and responsive

Institute for Agriculture and Trade Policy

Biomass Feedstock

- Avoid hazardous chemicals
- Avoid GMOs
- Conserve soil & nutrients
- Biological diversity
- Sustainable agriculture plan
- Protect workers

Manufacturing

- Support sustainable feedstock
- Reduce fossil energy use
- Avoid problematic blends & additives
- Avoid untested chemicals and engineered nano particles
- Design for recycling & composting
- Maximize process safety/reduce emissions
- Green chemistry
- Protect workers

End of Life

COMPOSTABLE

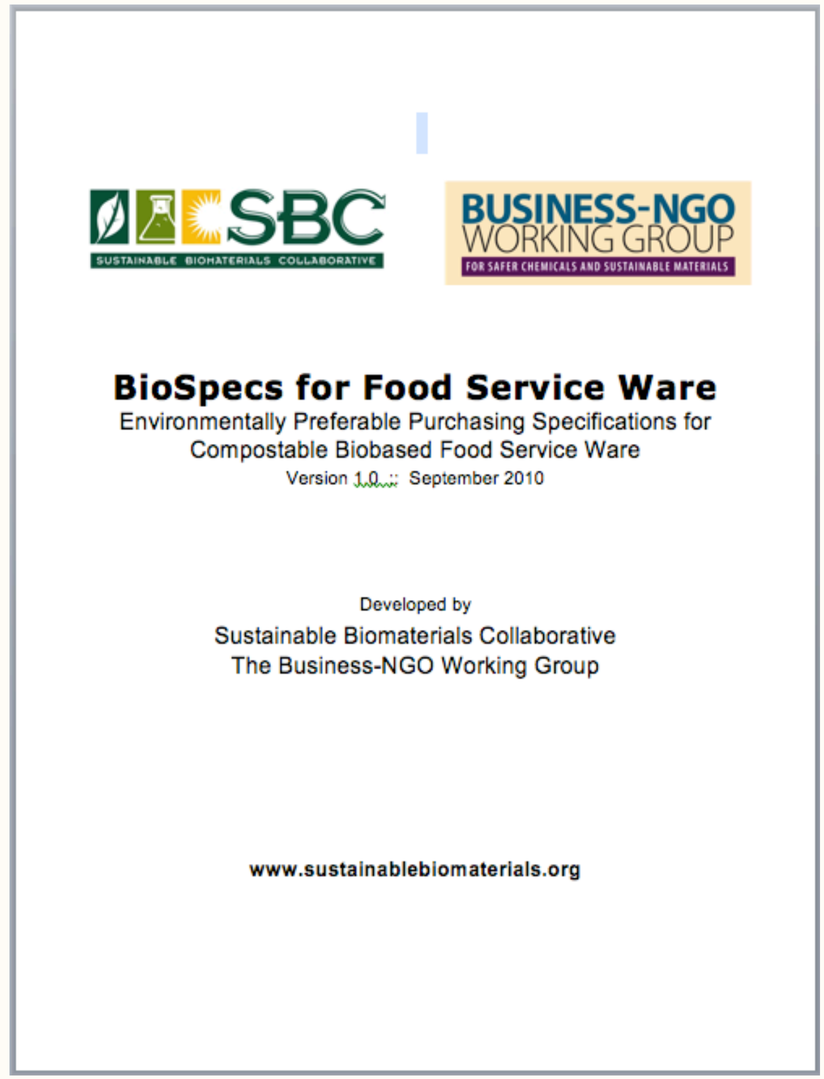
Biodegradable Products Institute | US COMPOSTING COUNCIL

- Compostable or recyclable
- Biodegradable in aquatic systems
- Adequate product labeling
- Adequate recovery infrastructure

Blends: Steps to Best Practices

Avoid	Plastics w/ POPs in life cycle or manufactured w/ high hazard chems (PVC, PS, ABS, PC, PU)
OK	Blend with more preferable plastics (e.g., PE, PP, PET)
Improving	Compostable
Better	Blend only bioplastics
Best	**Pure bioplastic** **Fully compostable & recyclable**

Development of Specifications



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SUSTAINABLE BIOMATERIALS COLLABORATIVE

BUSINESS-NGO
WORKING GROUP
FOR SAFER CHEMICALS AND SUSTAINABLE MATERIALS

BioSpecs for Food Service Ware

Environmentally Preferable Purchasing Specifications for Compostable Biobased Food Service Ware

Version 1.0 :: September 2010

Developed by

Sustainable Biomaterials Collaborative

The Business-NGO Working Group

www.sustainablebiomaterials.org

Recognition Levels

- Bronze
  - → Baseline Criteria
  - → Easily Verifiable Criteria
- Silver
- Gold
  - → Highest Level
  - → More challenges to Verify Criteria

Criteria: Biomass Production

Criteria	Recognition Level
Biobased (organic) carbon content	
Product must be >90%	Bronze
Product must be >95%	Silver
Product must be >99%	Gold
Genetically Modified Plants	
No plastics may be made directly in plants	Bronze
GM crops allowed in field with offsets	Bronze
No GM biomass allowed in field	Silver
Sustainably grown biomass	
Forest and brushland-derived biomass	Bronze
Agricultural crop biomass	Gold
Protection of biomass production workers	Gold

Next Steps

- Vetting Products
  - → Develop auditor product assessment protocol
  - → Manufacturers submit products for review
  - → Beta-test product assessment protocol
- Work with purchasers to beta-test bid specs
- Expand working landscape certificates

Parting Thoughts

- Life cycle thinking – taking a "principle-based" approach to sustainable materials
  - Define what we want
  - Set priorities
    - Sustainable feedstocks
    - Green chemistry
    - Cradle to cradle

- Transitioning from fossil fuels to renewable, biobased feedstocks
  - Biobased not inherently better
  - Need criteria & standards for defining sustainable biomaterials and plastics across their life cycle
    - No GMOs in field
    - Inherently safer chems
    - Concerns with nano
    - Reuse, recycle, compost

David Levine

Co-founder & Executive Director

The American Sustainable Business Council is a growing coalition of business organizations and businesses working to advance policies that support a vibrant, just and sustainable economy

Founding Partner, Green Harvest Technology

Steering Committee, Sustainable Biomaterials Collaborative

It can be different!

Feedstocks Crops can be part of a sustainable farming system

But markets and policies need to support it

WORKING LANDSCAPES CERTIFICATE

The WLC program is a first, crucial step to create truly sustainable biomaterials. In this phase, the focus is on driving more sustainable production of commodity crop feedstocks for use in biomaterials refining. Further stages will emphasize direct sourcing of these more sustainable feedstocks and, ultimately, a transition toward perennial grasses and other more sustainable feedstocks.

WLC WORKING LANDSCAPES CERTIFICATE

WLC Goals

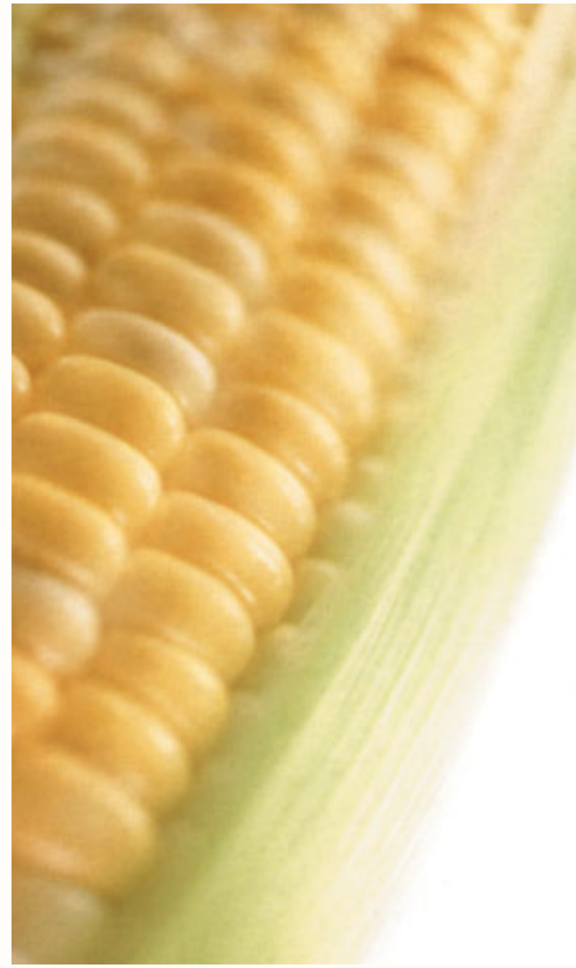
WLC Farmer in Minnesota

The "Ultimate" Green Job!

- Farmers receive a higher and more stable price for sustainable production
- Expanded production of sustainable feedstocks
- Growth of markets for sustainable products
- Begin movement towards perennial biomass feedstocks

WORKING LANDSCAPES CERTIFICATE

www.workinglandscapes.org



- Support existing family farmers economically to transition to sustainable farming practices
- Enable bioplastic customers to support more sustainable crop production
- Do not require “identity-preserve” infrastructure and additional transaction costs

WORKING LANDSCAPES CERTIFICATE

2010 Corn Production Criteria

www.workinglandscapes.org

- No GMO varieties
- No continuous cropping
- Soil testing and fertilization according to state criteria and test results
- No use of known human or animal carcinogenic chemicals
- Use of cover crops or at least 70% of residues left on entire field
- Creation of whole farm plan that includes biodiversity and energy aspects

General Statistics

- 8680 lbs of corn per acre, anticipated average yield
- 3472 lbs of PLA per acre
- 2.5 lbs of corn for 1 lb of PLA
- Each certificate is equivalent to 1 acre

Institute for Agriculture and Trade Policy

Farmers

Certifies farm practices

WORKING LANDSCAPES WLC CERTIFICATE

Contracts with farmers

Companies

green harvest TECHNOLOGIES

Stonyfield Organic SINCE 1983

Contracts for WLC

WORKING LANDSCAPES CERTIFICATE

Growth of program

- 50 acres 2007 and 2008
- 86 acres 2009
- 500 acres 2010

WLCs in 2010

- Stonyfield Farm is first major buyer of WLCs
  - Shifted to PLA for multipack yogurt cups
- Supports over 500 acres of more sustainable corn production
  - Equivalent to 200 million cups

WLC available to companies

Joe , WLC Farmer

green harvest TECHNOLOGIES

- A pound for pound answer for transition
- Assisting businesses to transition to biobased materials and products
- Enable bioplastic customers to support more sustainable crop production
- A pathway to more sustainable biobased production

Working Landscapes Certificate 2010 Pricing

$/lb	Consumption (MT)	Consumption (lbs)	Acres	$/acre
$0.0259	Up to 10	(22,000 lbs)	6 acres and under	$90/acre
$0.0230	10 to 99.99	22,000 to 220,378 lbs	6.33 to 63 acres	$80/acre
$0.0213	100 to 999.99	220,400 to 2,203,977 lbs	63 to 635 acres	$74/acre
$0.0207	1,000 to 9,999.99	2,204,000 to 22,039,977 lbs	635 to 6,347 acres	$72/acre
$0.0204	10,000 to 99,999.99	22,040,000 to 220,399,977 lbs	6,347 to 63,479 acres	$71/acre
$0.0203	100,000+	Above 220,400,000 lbs	Above 63,479 acres	$70.50/acre

Transitioning to Next Generation

- Biomass crops offer a way out of the food crop overlap
- Reduce energy and water inputs and GHG emissions
- Increase biodiversity and wildlife habitat and environmental benefits
- Other issues do emerge

Market Support for Sustainable Farming and Bioplastic Feedstocks

- Sustainability standards labels and standards
- Offset programs
- Local and environmentally-preferential programs
- Informed eaters
- Innovative companies
- Businesses working together to build demand for sustainable feedstocks *and* materials

Policy Support for Sustainable Farming and Bioplastic Feedstocks

- Conservation Stewardship Program is a good beginning for providing incentives for sustainable practices
- Biomass Crop Assistance Program
- With new emerging threats from global warming, need more support for diverse crop production to meet adaptation and fertility needs
- Incentives for advancing domestic feedstock production and biobased product manufacturing

Comments? Questions?

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